

## C. REMARKS

The claims have been amended in order to place the application in better form.

Claims 1, 5, and 6 have been cancelled without prejudice, and Claims 25-28 have been added. Claims 2-4 and 7 have been amended such that they now depend directly or indirectly upon Claim 25. The fact that Claims 1, 5, and 6 have been cancelled without prejudice is not to be construed as an admission by Applicants or Applicants' attorneys that such claims are not patentable, and Applicants reserve the right to prosecute such claims in a continuing application.

Claims 1 and 4-6 stand rejected under 35 U.S.C. 102(b) as being anticipated by Kocal. This rejection is respectfully traversed.

The present invention, as defined broadly in Claim 25, is directed to a zeolite having an AAI of at least 1.2. The zeolite has been prepared by a process including removal of a tetraethylammonium templating agent. The process comprises removing the templating agent at a temperature of no greater than 550°C and under conditions wherein after removal of the templating agent, the zeolite has an AAI of at least 1.2. The zeolite is selected from the group consisting of zeolite Beta, TEA-mordenite, and TEA-ZSM-12.

Applicants have found surprisingly that by controlling the heat treatment or calcination to remove the tetraethylammonium templating agent such that the catalyst is heated at a temperature that is no greater than 550°C, acid sites of a specific nature and strength are created. Such acid sites, known as "strong acid sites," are formed surprisingly to enhance significantly catalytic performance in reactions such as hydrocarbon conversion technologies and environmental abatement technologies. Applicant also has found that, contrary to what was recognized by the prior art, the abundance of the strong acid sites is beneficial in aromatics alkylation technologies, such as the ethylation of benzene to form ethylbenzene. Such improved performance is

characterized in that the catalysts of the present invention have an Acidity-Activity Index, or AAI, of at least 1.2.

The Examiner's attention is directed to Examples 1 through 4. In these examples, one sample of zeolite beta, lab sample 1, was calcined at up to 650°C to remove the tetraethylammonium templating agent. Another sample, lab sample 2, was calcined at up to 500°C to remove the tetraethylammonium templating agent. The Acidity-Activity Index, or AAI, and first order constants in the alkylation of benzene to ethylbenzene for each sample catalyst, were measured. For lab sample 1, the AAI was 0.661, and the first order rate constant was 0.31 cm<sup>3</sup>/g/sec. For lab sample 2, a catalyst in accordance with the present invention, the AAI was 2.19, and the first order rate constant was 0.95 cm<sup>3</sup>/g/sec. Thus, Applicants have demonstrated enhanced catalytic performance when the calcining of the catalyst to remove a tetraethylammonium templating agent is regulated in accordance with the present invention.

Kocal discloses a process for producing aromatic compounds from C<sub>2</sub>-C<sub>6</sub> aliphatic hydrocarbons. The C<sub>2</sub>-C<sub>6</sub> aliphatic hydrocarbon feedstock is passed into a reaction zone and into contact with two discrete catalysts. The first catalyst is comprised in part of a ZSM-5 zeolite catalyst. The second catalyst is comprised in part of a catalyst which is not a ZSM-5 catalyst, and has an acidity which is lower than that of the first catalyst. The second catalyst may be silicalite. The first catalyst may include one or more of ZSM-5, ZSM-8, ZSM-11, ZSM-12, or ZSM-35.

In addition, Kocal, in Example 1, describes temperature programmed desorption (TPD) experiments for ZSM-5, silicalite, and H-mordenite.

Kocal, however, does not disclose or even remotely suggest to one of ordinary skill in the art a catalyst which may be zeolite beta, TEA-mordenite, or TEA-ZSM-12, which has an AAI of at least 1.2 and which has been prepared by a process including removal of a tetraethylammonium templating agent, wherein the templating agent is removed at a temperature of no greater than 550°C. Therefore, Kocal does not anticipate Applicants' claimed zeolite, nor does Kocal render Applicants' claimed zeolite

obvious to one of ordinary skill in the art. It is therefore respectfully requested that the rejection under 35 U.S.C. 102(b) be reconsidered and withdrawn.

Claims 1, 4, and 7 stand rejected under 35 U.S.C. 102(e) as being anticipated by Butler, et al. This rejection is respectfully traversed.

Butler discloses the alkylation of benzene to produce ethylbenzene in the presence of a silicalite catalyst. Butler, however, does not disclose or even remotely suggest to one of ordinary skill in the art a catalyst which is zeolite beta, TEA-mordenite, or TEA-ZSM-12, having an AAI of at least 1.2. Butler also does not disclose or even remotely suggest to one of ordinary skill in the art that the zeolite may be prepared by a process comprising removing a tetraethylammonium templating agent at a temperature of no greater than 550°C and under conditions wherein after removal of the templating agent, the zeolite has an AAI of at least 1.2. Thus, Butler does not anticipate, or render obvious to one of ordinary skill in the art, Applicants' zeolite as claimed. It is therefore respectfully requested that the rejection under 35 U.S.C. 102(e) be reconsidered and withdrawn.

Claim 7 stands rejected under 35 U.S.C. 103 as being unpatentable over Kocal. This rejection is respectfully traversed.

As stated hereinabove, Kocal does not disclose or even remotely suggest to one of ordinary skill in the art a zeolite beta, TEA-mordenite, or TEA-ZSM-12 catalyst, as claimed. Therefore, Kocal does not even remotely suggest to one of ordinary skill in the art a zeolite beta, TEA-mordenite, or TEA-ZSM-12 catalyst, as claimed, having an AAI of at least 1.2, and which has a molar ratio of silica to alumina of at least 15:1, as defined in Claim 7. It is therefore respectfully requested that the rejection under 35 U.S.C. 103 be reconsidered and withdrawn.

Claims 2 and 3 stand rejected under 35 U.S.C. 103 as being unpatentable over Kocal in view of Yao, et al. This rejection is respectfully traversed.

Kocal, as stated hereinabove, does not even remotely suggest to one of ordinary skill in the art zeolite beta, TEA-mordenite, or TEA-ZSM-12 catalyst, as claimed, having an AAI of at least 1.2. Yao discloses a catalyst composition for converting a hydrocarbon stream to olefins and C<sub>6</sub> to C<sub>8</sub> aromatic hydrocarbons. The catalyst includes a zeolite such as ZSM-5 and similar zeolites.

Yao is relied upon by the Examiner because the catalyst may have a pore volume from about 0.4 ml/g to about 0.8 ml/g, and an average pore diameter of from about 70 Angstroms to about 300 Angstroms. Yao, like Kocal, however, does not disclose or even remotely suggest to one of ordinary skill in the art zeolite beta, TEA-mordenite, or TEA-ZSM-12, as claimed, having an AAI of at least 1.2, and which has been prepared by a process including the removal of a tetraethylammonium templating agent wherein the templating agent is removed at a temperature of no greater than 550°C. Therefore, the combination of Kocal and Yao does not render Applicants' zeolite beta, TEA-mordenite, or TEA-ZSM-12, as claimed, having an AAI of at least 1.2, obvious to one of ordinary skill in the art, and it is therefore respectfully requested that the rejection under 35 U.S.C. 103 be reconsidered and withdrawn.

For the above reasons and others, this application is in condition for allowance, and it is therefore respectfully requested that the rejections be reconsidered and withdrawn and a favorable action is hereby solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Raymond J. Lillie". The signature is fluid and cursive, with the first name being the most prominent.

Raymond J. Lillie  
Registration No. 31,778